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Renewable Resources Inventory

LAND INFORMATION SUPPORT SYSTEM IMPLEMENTATION PLAN AND SCHEDULE

S. S. Yao

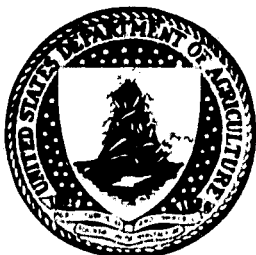
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LAND INFORMATION SUPPORT SYSTEM
IMPLEMENTATION PLAN AND SCHEDULE

Job Order 72-543

This report describes activities of the Renewable Resources
Inventory project of the AgRISTARS program.

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1. INTRODUCTION

The Resource Planning Act (RPA) of 1974 and later amended by the National Forest Management Act (NFMA) of 1976 is the Congressional mandate to the U.S. Forest Service to prepare land management plans (LMPs) for all 150 forests under their jurisdiction. The RPA and NFMA provide general guidelines on how the LMPs will be developed. The Renewable Resources Inventory (RRI) project of the AgRISTARS program has placed a high priority task to provide the national forests with a computer based land information support system (LISS) using remote sensing technology to support and supplement the preparation and development of the LMPs. The proposed task is to last five years. This document outlines an implementation plan for LISS developed based on current remote sensing and computer technology, adapting a Geographic Information System (GIS) approach. Section 2 states the objective and scope of the plan. Section 3 discusses tasks planning and the various requirements definitions. Section 4 details computer technology system capability development, including the survey of existing GIS, the definition of new software requirements and new applications programming. In Section 5, the necessary research and development support for procedural development is discussed. Section 6 outlines an exploratory experiment or pilot test, based on the developed procedures, beginning from the experiment design and ending in the accuracy assessment. The procedures are then to be evaluated by the forest users (Section 7) before final technology transfer can take place as discussed in Section 8. A rough schedule of the plan is also included.

2. OBJECTIVE AND SCOPE

The objectives of the plan are:

- a. To specify the objectives of the LISS as documented in AgRISTARS/RRI Implementation Plan.
- b. To identify major activities, the interactions between the activities, and all schedules and deliverables.

The scope of the plan is to document the necessary resources and time frame in order to carry out the plan.

3. TASK PLANNING

The task planning consists of two sections:

- a. Requirements definition, Section 3.1, where the requirements to support Forest Service data analysis for the land management process are developed, and
- b. Task plan development, Section 3.2, where the task plans for the transfer of technology to support implementation of a Forest Service Land Information Support System are developed. Major milestones and deliverables are also identified in the task plans.

3.1 REQUIREMENTS DEFINITION

3.1.1 OBJECTIVE

To define, develop, and determine a set of requirements with inputs from the Forest Service on how remote sensing data analysis technology can be developed, evaluated, and transferred to support the Forest Service Land Management process.

3.1.2 MAJOR ACTIVITIES

Two levels of requirement documents will be written. The first one is the preliminary requirements needed by the task plan to carry out a pilot test project at San Juan National Forest (SJNF). The inputs to this requirements document are the San Juan Land Management Planning documentations and the Forest Service reviewed Land Management Planning preliminary requirements.

The second requirements document will draw input from the Forest Service Land Management Planning final requirements written after the pilot test and the conclusion of a system study of the Land Information Support System environment. The document will feed the updated task plan for the technology transfer.

3.1.3 MILESTONES AND DELIVERABLES

3.1.3.1 Milestones

Input milestones for the preliminary requirements document are:

- a. SJNF field trip by 4/1/81.
- b. Land Management Planning Support System preliminary requirements outline by 6/1/81.
- c. Forest Service reviewed final requirements by 9/15/81.

Input milestones for the technology transfer requirements document are:

- a. Forest Service Land Management Planning final requirements by 1/15/83.
- b. Forest Service Land Management Planning system study completed by 4/1/83.

3.1.3.2 Deliverables

- a. Pilot test requirements document by 10/1/81. This document feeds pilot test task plan, Section 3.2; and Research and Development procedure development, Section 5.1.
- b. Technology transfer requirements document by 6/1/83. This document feeds updated task plan, Section 3.2 and the technology transfer ICD's, Section 8.1.

3.2 TASK PLAN DEVELOPMENT

3.2.1 OBJECTIVE

To develop task plan that provide overall direction and control for using remote sensing data analysis technology for Forest Service Land Information support system (RRI task 6-4).

3.2.2 MAJOR ACTIVITIES

A two-phase approach is used to develop the task plan. The initial phase of the task plan draws input from the pilot test requirements document in order to provide specification for the experiment design for the pilot test. During the second phase, the updated task plan draws input from the technology transfer requirements document and serve as input milestone to the technology transfer plan.

3.2.3 MILESTONES AND DELIVERABLES

3.2.3.1 Input Milestones

- a. Forest Service reviewed pilot test requirements for phase 1 task plan by 9/15/81.
- b. Technology transfer requirements document for updated task plan by 6/1/83.

3.2.3.2 Deliverables

- a. Preliminary draft of task plan by 6/1/81.
- b. Phase 1 task plan by 10/1/81. This task plan is needed for the experiment design of the pilot test, Section 6.1.1.

- c. Updated task plan by 8/1/83. This task plan is needed for the final technology transfer plan, Section 8.2.

4. SYSTEM CAPABILITY DEVELOPMENT

This section discusses the system support needed in order to carry out RRI tasks. In particular, the system support needed to carry out procedure development and the pilot test discussed in Sections 5 and 6, and for technology transfer, Section 8 is outlined.

4.1 RRI/EODLS SYSTEM STUDY

4.1.1 OBJECTIVE

To study the role that can be played by the GIS software in the EODLS environment to carry out the pilot test, and to study the Forest Service Land Management Planning system environment to carry out the technology transfer.

4.1.2 MAJOR ACTIVITIES

There are two major activities. In the first one, VICAR and other GIS software that have been used to support RRI work will be evaluated at EODLS. This software, together with additional software requirements identified in the Research and Development procedure development, will be used to support application programming for the pilot test. In the second activity, Forest Service Land Management Planning system environment will be studied given the Forest Service Land Management Planning final requirements, in order to identify additional support needed for technology transfer.

4.1.3 MILESTONES AND DELIVERABLES

4.1.3.1 Input Milestone

- a. EODL implementation on AS/3000 tracking by 4/15/81.
- b. VICAR implementation on AS/3000 completion by 8/1/81.
- c. RIDS/Agena and other GIS study by 9/1/81.
- d. Forest Service Land Management Planning final requirements by 1/15/83.

4.1.3.2 Deliverables

- a. RRI/GIS study report by 10/1/81. This report will initiate definition of software requirement, Section 4.2.
- b. Forest Service Land Management Planning study report by 4/1/83. This report will be used by the requirements definition, Section 3.1; updated task plan, Section 3.2; and, transfer plan, Section 8.2.

4.2 RRI/EODLS SOFTWARE REQUIREMENT DEFINITION

4.2.1 OBJECTIVE

To define software requirements in the EODLS environment in order to carry out the pilot test as discussed in Section 6.

4.2.2 MAJOR ACTIVITIES

A set of RRI/GIS software requirements are defined based on the VICAR/GIS study in Section 4.1. After system implementation, with additional requirements from the procedure development, Section 5.1, and from MAIS interface study, a set of pilot test software requirements will then be defined for application programming and implementation.

4.2.2.1 Input Milestones

Input milestones for software requirements for RRI/GIS from GIS study is 10/1/81. Those requirements for pilot test from procedure development is 1/1/82. The MAIS/LISS interface requirements is due 2/1/82.

4.2.2.2 Deliverables

Pilot test software requirements for application programming, Section 4.3 by 3/1/82.

4.3 RRI/EODLS SUPPORT SYSTEM APPLICATION PROGRAMMING

4.3.1 OBJECTIVE

To implement application programming on EODLS system in order to carry out the pilot test discussed in Section 6.

4.3.2 MAJOR ACTIVITIES

Application programming is done using both RRI/GIS and EODL facilities for procedure development. When the task plan is written, and pilot test software requirements received, application programming is then implemented on the RRI system for pilot test. The start of implementation is subjected to the installation of the RRI/EODLS and RRI/GIS hardware system.

4.3.3 MILESTONES AND DELIVERABLES

4.3.3.1 Input Milestones

The input milestones for application programming implementation are:

- a. Preliminary R&D procedure by 1/1/82.
- b. Pilot test software requirements by 3/1/82.

4.3.3.2 Deliverables

Fully implemented system by 8/1/82 for procedure shakedown, Section 5.1.

5. RRI/RESEARCH AND DEVELOPMENT SUPPORT

This section discusses the research and development support needed to carry out the pilot test in the San Juan National Forest. Emphasis will be placed on the identification of one procedure which is to be tested and documented for renewable resource inventory using the Landsat MSS and other remote sensing data together with other ancillary information for the San Juan National Forest.

5.1 PROCEDURE DEVELOPMENT

5.1.1 OBJECTIVE

To identify a procedure which is to be tested and documented on how Landsat and other remote sensing data together with ancillary information such as topographic and soil type can be used for renewable resources inventory. The procedure will be evaluated over the San Juan National Forest, but the development will continue with the goal that it be applicable to all national forests.

5.1.2 MAJOR ACTIVITIES

Labeling and classification procedure development efforts will receive input from the documented requirements definitions and be constrained by the hardware and software support available from RRI/GIS and EODLS as discussed in Section 4. During the process of procedure development, additional software requirements will be generated and fed into the software requirements definition of the support system, Section 4.2. Before the pilot test data

analysis begins and after the final implementation of the procedure completes, a two-month shake down of the procedure is also planned.

5.1.3 MILESTONES AND DELIVERABLES

5.1.3.1 Input Milestones

- a. EODLS system implementation completed 8/1/81.
- b. SJNF Land Management Planning draft requirements by 10/1/81.
- c. Pilot test software requirements document by 3/1/82.
- d. RRI/GIS and EODLS system implementation completed by 8/1/82.

5.1.3.2 Deliverables

The deliverables for procedure development are:

- a. Preliminary procedure available by 1/1/82 for pilot test design, Section 6.1.1; and additional software requirements definition, Section 4.2.
- b. RRI/Land Management Planning procedure available for pilot test analysis, Section 6.2 by 10/1/82.

6. LAND MANAGEMENT PLANNING PILOT TEST

This section discusses the Land Management Planning Pilot Test. The purpose of the pilot test is to quantitatively evaluate a selected set of Landsat data analysis techniques developed in Section 5 against San Juan National Forest Land Management Planning performance goals in order to provide a set of recommendations to support the transfer of a selected set of technology to Forest Service to support the implementation of a Land Management Planning support system.

Section 6.1 discusses the design aspect of the pilot test. Section 6.2 discusses how the pilot test is to be carried out, and in Section 6.3, how the pilot test is to be evaluated against a set of accuracy assessment criteria.

6.1 LAND MANAGEMENT PLANNING PILOT TEST DESIGN

6.1.1 OBJECTIVE

To provide a detailed experiment design, an implementation plan in order to carry out the pilot test.

6.1.2 MAJOR ACTIVITIES

- a. Experiment Design: The experiment design phase of the activity takes the pilot test requirements document from Section 3.1, the task plan from Section 3.2 and integrate the site study, the data requirements, the available best procedure from Section 5.1, etc. in order to come up with the overall design.

- b. Implementation Plan: After the completion of the experiment design, the procedures and methodologies used in the pilot test will be implemented in EODLS facilities in order to come up with a RRI/GIS and EODLS system for carrying out the pilot test.

6.1.3 MILESTONES AND DELIVERABLES

6.1.3.1 Input Milestones

- a. Pilot test documents from Section 3.2 for experiment design by 10/1/81.
- b. Preliminary procedure developed in Section 5.1 by 1/1/82 for experiment design.

6.1.3.2 Deliverables

- a. Experiment design completion by 5/1/82 for implementation plan, Section 6.1.2.
- b. Final implementation plan completed by 9/1/82 in order to carry out the actual pilot test, Section 6.2.

6.2 LAND MANAGEMENT PLANNING PILOT TEST ANALYSIS

6.2.1 OBJECTIVE

To carry out the pilot test over San Juan National Forest, collect data and perform the analysis.

6.2.2 MAJOR ACTIVITIES

The Land Information Support System pilot test over San Juan National Forest will be carried out according to the experiment design, and the implementation plan. Data collected during the pilot test and the applicability to the procedure will be carefully analyzed.

6.2.3 MILESTONES AND DELIVERABLES

6.2.3.1 Input Milestone

The pilot test begins when the implementation plan is completed (Section 6.1.2) and the RRI/LMP procedure ready for testing (Section 5.1). All these should occur by 10/1/82.

6.2.3.2 Deliverables

The analysis should be completed and ready for accuracy assessment by 4/1/83.

6.3 ACCURACY ASSESSMENT FOR LAND MANAGEMENT PLANNING EXPLORATORY EXPERIMENT

6.3.1 OBJECTIVE

To assess the success of the test plan according to criteria established in the experiment design.

6.3.2 MAJOR ACTIVITIES

Assessing the accuracies of the pilot test with criteria established in the experiment design, against the ground truth collected over the San Juan National Forest. Recommend improvements.

6.3.3 MILESTONE AND DELIVERABLES

6.3.3.1 Input Milestone

Final analysis results from Section 6.2 by 4/1/83.

6.3.3.2 Deliverables

Final evaluation and recommendation document by 8/1/83. This document will be used for Forest Service user evaluation, Section 7.0, and as input to the technology transfer plan, Section 8.2.

7. USER EVALUATION

7.1 OBJECTIVE

After the completion of the San Juan National Forest pilot test, the data analysis results and accuracy assessment evaluation documentation will be used by the Forest Service for further evaluation from end user point of view.

7.2 MAJOR ACTIVITY

The activities will be determined by the Forest Service.

7.3 MILESTONE AND DELIVERABLES

7.3.1 INPUT MILESTONE

Pilot test accuracy assessment evaluation document by 8/1/83.

7.3.2 DELIVERABLES

Forest Service evaluation report by 11/1/83. This report will be an input to the technology transfer plan as discussed in Section 8.2.

8. TECHNOLOGY TRANSFER

The evaluations and recommendations resulted from the pilot test from all participating agencies will be integrated with the final Forest Service Land Management Planning requirements for transfer of technology to support the Forest Service Land Information Support System by the end of fiscal year 1985.

8.1 TECHNOLOGY TRANSFER ICD'S

8.1.1 OBJECTIVE

To define and document the agree-upon roles played by NASA and Forest Service in terms of resources and personnel for the technology transfer to support Forest Service Land Management Planning system.

8.1.2 MAJOR ACTIVITIES

- a. Define roles and responsibilities of the two agencies in terms of resources and personnel.
- b. Document the agree-upon roles between the agencies.

8.1.3 MILESTONES AND DELIVERABLES

8.1.3.1 Input Milestone

The ICD is triggered by the Forest Service final Land Management Planning requirements document to be available by 1/15/83, and the technology transfer requirements document from Section 3.1 available by 6/1/83.

8.1.3.2 Deliverables

Final technology transfer ICD's to transfer plan, Section 8.2 by 8/1/83.

8.2 TECHNOLOGY TRANSFER PLAN

8.2.1 OBJECTIVE

To draw up a technology transfer plan for transfer of remote sensing technology to support the Forest Service Land Management Planning system.

8.2.2 MAJOR ACTIVITIES

The transfer plan begins with a study of the Forest Service Land Management Planning system capability. It then integrates the transfer task plan, the pilot test final evaluations and recommendations, the Forest Service user evaluation and comes up with a final technology transfer plan.

8.2.3 MILESTONES AND DELIVERABLES

8.2.3.1 Input Milestones

- a. Forest Service Land Management Planning system capability study document by 4/1/83.
- b. Transfer ICD's by 8/1/83.
- c. Forest Service user evaluation of pilot test document by 11/1/83.

8.2.3.2 Deliverable

A final technology transfer plan by 1/15/84 for initiation of the actual transfer, Section 8.3.

8.3 TECHNOLOGY TRANSFER TO SUPPORT FOREST SERVICE LAND MANAGEMENT PLANNING PROCESS

8.3.1 OBJECTIVE

To transfer remote sensing technology to an operational environment to support the Forest Service Land Management Planning system.

8.3.2 MAJOR ACTIVITIES

Based on the technology transfer plan, implement a selected set of technologies that make use of the remote sensing and computer technology to support the Forest Service Land Management Planning system.

8.3.3 MILESTONE AND DELIVERABLES

8.3.3.1 Input Milestone

Input milestone is the final technology transfer plan from Section 8.2 by 1/15/84.

8.3.3.2 Deliverables

Final completion of the technology transfer by 9/30/85.

